



USCC Position Statement: Keeping Organics Out of Landfills

The US Composting Council is firmly opposed to landfilling yard debris and other source-separated organics when viable alternatives are available. It is an inefficient way to use our organic feedstocks—wasting resources, reducing recycling, and potentially increasing greenhouse gas emissions.

As the world focuses on mitigating and preventing the consequences of global climate change there is a heightened awareness of the significant impact of landfill-generated methane emissions. This recognition is increasing the importance of recovering organics through composting and anaerobic digestion, since it is the organics that are buried in landfills that are the source of this methane. Currently there are 23 states that ban some fashion of organics disposal in landfills, mostly leaves, grass and other yard debris. It is unfortunate and ironic that these easiest-to-recycle materials are now the target of some entities who want to overturn organics landfill bans under the premise that the methane these organics would generate can be used as an energy source. The US Composting Council is firmly opposed to landfilling yard debris and other source-separated organic wastes. From both energy and resource conservation standpoints this is a wasteful use of resources, decreasing recycling and the life of our landfills and potentially increasing greenhouse gas emissions. Yard trimmings should be recycled into mulch and compost that can be used to enhance the health of our soils and plants and protect our water resources.

The USCC is a non-profit 501(c)(6) trade and professional organization promoting composting and compost use. We provide a unified voice for the growing composting industry. The US Composting Council is involved in research, public education, composting and

compost standards, expansion of compost markets and the enlistment of public support.

Growth of US Composting

In 2005, an estimated 245.7 million tons of municipal solid wastes were generated in the United States, that's 4.5 pounds per person per day. Organic materials—comprised of yard trimmings, food scraps, wood waste, paper and paperboard products—are the largest component of our trash and make up about two-thirds of the solid waste stream.

According to the US Environmental Protection Agency, "Reducing, reusing, recycling, and rebuying—the four "Rs"—is key to diverting organic materials from landfills or incinerators and protecting human health and our land, air, and water. Waste reduction and recycling prevents greenhouse gas (GHG) emissions, reduces pollutants, saves energy, conserves resources, and reduces the need for new disposal facilities...Yard trimmings and food residuals by themselves constitute 24 percent of the U.S. municipal solid waste stream... Composting offers the obvious benefits of resource efficiency and creating a useful product."¹

As a nation, we have made remarkable strides towards recycling these materials, primarily through the development of effective composting technologies. Whereas in 1990 recovery via composting only diverted 2% of the total solid waste stream, we now recover 20% through composting, including 62% of all yard trimmings (USEPA, 2006a). Unfortunately, confusion over how to deal with global climate change among some members of industry, government, and the general public threatens to undo these gains.

The Climate Change-Organics Connection

Global climate change threatens to cause dramatic ecological change for people, nations and environmental systems worldwide (see USCC factsheet: Composting and Global Climate Change: a Primer for Producers). While too late to completely stop, there is much to be done to reduce and delay the effects. Global climate change is caused by an increase in greenhouse gases in the atmosphere, the result of the burning of fossil fuels and other human activities. Carbon dioxide is the main greenhouse gas (GHG), but methane, nitrous oxide and other gases also make significant and disproportionately large contributions to climate change. When organic materials decompose naturally, the CO₂ they give off, while still a greenhouse gas, is part of the natural (biogenic) short-term carbon cycle². Since this is part of the natural flow of CO₂ between vegetation and the

¹ <http://www.epa.gov/epaoswer/non-hw/organics/index.htm>

² Carbon is constantly removed from the atmosphere by plant photosynthesis, moved among organisms through the foodweb and released by via decomposition.

atmosphere it has little impact on global warming compared to the “mined” CO₂ produced by burning fossil fuel. However, when those same organic materials are placed in a landfill (anaerobic) environment the decomposers will convert and release the carbon as methane and other volatile organic compounds which DO contribute to global climate change. Recent waste composition studies estimate that approximately 72% of the municipal waste stream going to landfills is organic (6% wood, 7% textiles/leather, 13% yard debris, 12% food scraps, 34% paper). The US EPA has identified landfills as the single largest source of methane (CH₄), a potent greenhouse gas that is 23 times more efficient at trapping heat than carbon dioxide (CO₂). Landfills contribute approximately 34% of all man-made methane released to the atmosphere in the US (USEPA, 2007).

Landfilling Organics

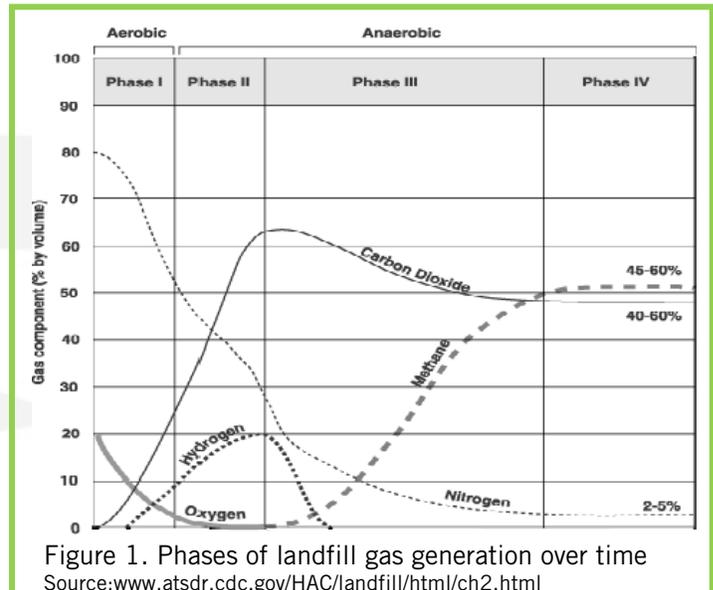
Over the last quarter-century, state-of-the-art landfill management, known as “dry tomb”, has been used to bury wastes in landfills so that they become sealed away from the environment. Entombment is achieved by lining the bottom of landfills with a thick impervious layer of geotextiles and clay, compacting the waste as it is buried, and covering each day’s fill with soil or similar material. Once filled, the landfill is “capped” with another impervious layer. The leachate that seeps to the bottom of the landfill is collected and treated. All of these steps, eliminate or lower the overall moisture level in the landfill and as such significantly reduce the overall level of biological activity. Any buried organic materials decompose in this moisture and oxygen-starved environment, some more rapidly than others, generating landfill gas that contains methane and other harmful gaseous by-products.

Landfill gas (LFG) is hazardous and potentially explosive. In 1996, the EPA amended its landfill regulations³ to require most landfills to have gas collection systems. The EPA also requires most landfills to monitor gas emissions and modify / expand gas collections systems when emissions reach certain thresholds. Collected gas may be burned (flared) to convert it to mostly CO₂ and water, or used as an energy source⁴. Figure 1 shows the change in chemical composition of the gas produced by organic materials in landfills as they decompose, finally stabilizing at a roughly 50-50 mix of methane and CO₂, with trace levels of other gases mixed in. The length of each phase depends on the type of wastes going in the landfill and the management of the landfill. For some materials, it may take several years to reach Phase IV, which may then last for many decades. Landfill owners

³ Subtitle D of the Resource Conservation and Recovery Act is the main body of landfill regs. For a complete list go to http://www.epa.gov/epaoswer/non-hw/muncpl/landfill/msw_regs.htm.

⁴ Besides controlling its flammability, raw LFG is 23 times more toxic than its combustion products (NRDC, 2003, full report at <http://www.nrdc.org/air/energy/lfg/lfg.pdf>)

are required to manage and control methane generation during the operational life of the landfill, and typically for a 30-year post-closure period.



Bioreactor Landfills

To accelerate methane production and to shorten the duration of Phase IV, EPA is testing new landfill designs as “bioreactors”. The idea is to increase the moisture content in the buried waste to greater than 40 percent, through a combination of leachate recirculation and adding supplemental liquid, to improve the conditions for decomposition and methane generation. At this time, there are 6 federally recognized “bioreactor” projects underway. Since the rate of methane production can be increased, it may be more economical to use as an energy source. The landfill operators could potentially benefit by increasing the usable landfill space and lifetime, and by generating revenues from the sale of energy. However, this technology is still under-development and facilities are not widespread.

The USCC recognizes that the diversion of all organic materials from the waste stream into reuse or recycling is not possible in the near term. We therefore support the development of bioreactor landfills as an improved management practice that reduces the burden placed on future generations by today’s waste disposal⁵. We also encourage the retrofitting of existing landfills with methane collection systems in order to capture as much as possible methane before it is emitted directly to the atmosphere. However, while doing a better job at managing, capturing and using errant landfill gas is a worthy goal, it in no way justifies any attempts to increase, or even to maintain, the amount of organics going to landfills. Here’s why:

⁵ Joint Statement on Composting and Bioreactor Landfills from The Solid Waste Association of North America (SWANA) and The U.S. Composting Council (USCC), http://www.compostingcouncil.org/pdf/SWANA_USCC_position.pdf

Avoiding Methane Generation

Organics wastes do not contain methane. It is only when they are placed in an anaerobic environment that methane is produced. Composting, while not perfectly aerobic, will generate very little, if any, methane. Composters work to maintain an aerobic environment in their piles. The very management parameters that make for good composting, like proper carbon:nitrogen ratio, adequate moisture and good airflow, also minimize methane generation. The US EPA has concluded that the greenhouse gas emissions from composting stem from the energy used to manage the operations, not from the composting process itself (USEPA, 2006b)

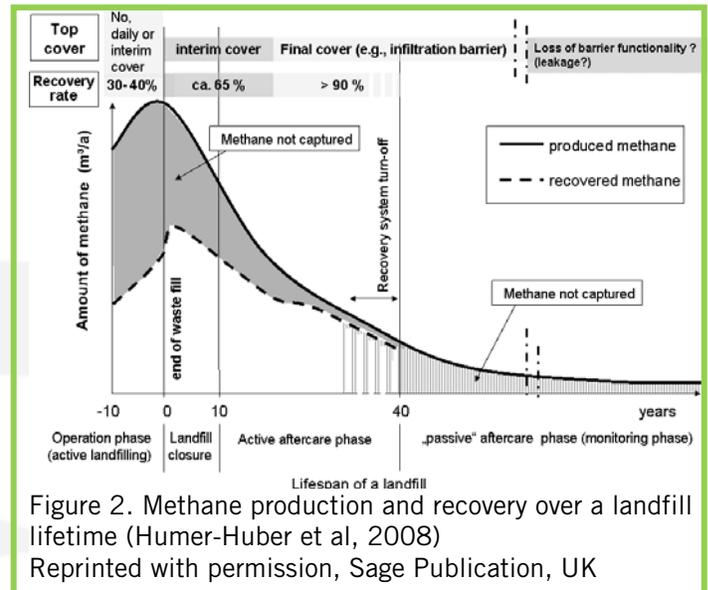
Errant Emissions

Methane collection at a landfill often does not begin until the active portion of the landfill (“the cell”) where the wastes are buried is “capped” (covered with an impermeable membrane). The timing of actual gas system installation is based on many factors including EPA requirements which require installation of such systems based on the age of in-place waste and a landfill’s potential to emit gas. Some landfill operators may begin collecting LFG prior to cell closure; however, since the landfill is not yet capped, a significant amount of gas still escapes to the atmosphere. The delay between when the waste is buried and when the gas collection system is in place does not matter for organics like paper, wood and fiber that decompose slowly. However, the more rapidly decomposing “putrescible” wastes, like grass clippings or food scraps, often start generating methane within a few days or weeks. Much of this methane can be lost to the atmosphere if a gas collection system is not in place. Figure 2 shows how the capture rate may change over the lifetime of a landfill.

The USEPA estimates that over the life of a landfill 25% of the methane generated in a landfill with gas collection will escape. Some advocates of bioreactors put that number as low as 10%, while some critics put it as high as 80%. The overall efficiency of the methane collection will vary depending on many factors, including the waste composition, the climate and the management of the landfill. However, by endeavoring to put more organic wastes in a landfill in order to increase methane production, a bioreactor landfill may be emitting more methane than its conventional counterpart, especially in the near term.

Space Saver?

It is true that one of the benefits of managing a landfill as a bioreactor compared to conventional management is that the accelerated decomposition rate increases the useful space at the landfill, prolonging the life of a landfill and delaying the need to site a new landfill.



However, if saving space is the goal, a better solution would be to divert organics from landfills altogether. By sending the organics to reuse or recycling, perhaps with an energy extraction step, space is saved at the landfill, and society gets the most benefit from its materials.

It's not recycling

The USCC’s position on putting organics in a landfill, whether a bioreactor or a dry tomb, is that disposal is a last resort. We recognize that the disposal of organics at landfills and the associated release of methane is partially due to the slow development of an alternative infrastructure. Composting is a viable alternative. Composting is recycling when these materials are used in the manufacture of something new and valuable. Whether it’s converting wood pallets to landscape mulch or transforming leaves and grass to humus-rich compost, recycling of organic “wastes” makes sense and creates products of real value.

The products of composting and mulch production have many environmental benefits: Compost is widely used as a soil amendment in residential and commercial landscape and garden beds for its ability to improve the physical, chemical and biological properties of the soil, leading to healthier plants. Compost and mulch are gaining wide acceptance in the development and construction fields for their role in erosion control and stormwater management. Compost is increasingly used in agriculture for its ability to improve soil health and fertility. The list of applications and the understanding of the uses and benefits of recycled organic materials continues to grow.

More than just “Green Energy”

Is landfill gas “green” energy? On one hand, the EPA says yes, and on that strength LFG qualifies as a renewable fuel in nearly all of the states that have

adopted some form of renewable energy portfolio standard (standards requiring power generators to provide a specified percentage of electricity from renewable fuels). (Weeks, 2005). On the other hand, several environmental groups, like the National Resources Defense Council and Grass Roots Recycling Network, do not agree, because of the potential to reduce recycling rates and uncertainty about emissions, both gaseous and liquid.

However, a more important question than the “greenness” of the energy produced is how to extract the maximum energetic value from organic residuals? Composts contain large amounts of organic carbon, rich in “biological energy”, which can fuel critical ecosystem functions, such as soil building and nutrient cycling. The opportunity to utilize this biological energy is lost for those organic materials that are buried in landfills – the use of landfill gas to produce renewable energy only partially recovers some of this value.

In any case leaves and branches are not good sources of methane. Eleazar et al (1997) showed that high amounts of lignin interfere with methane production. Only 28% of leaf mass and 29% of branches decomposed in a landfill environment, as compared to 94% of grass and 84% of food.

The USCC believes it makes more sense, from both energetic and greenhouse gas perspectives, to send organic feedstocks to either dedicated energy-extraction processes such as anaerobic digestion or to composting than to dispose of those feedstocks in landfills. In dedicated energy-extraction facilities the quality of the gas produced is much higher, and the errant emission rate is near zero. After digestion the solids can still be used as a soil amendment or a composting feedstock to provide essential ecosystem services.

Towards a Sustainable Future

Despite the well-recognized value of compost for improving the environmental sustainability of our gardens, yards, parks, cropland and forests, the economics of composting may not always be favorable as we transition away from common waste management practices. Composting operations can incur significant development and operating costs. Economic viability of compost operations is essential if they are to be sustainable. These facilities must be properly designed, operated, and monitored if diversion is truly going to be a success. It will require regulatory and public support to discourage unnecessary landfilling and promote the use of composting. Those supports come in two basic forms: 1) financial: those that increase the cost of alternatives or reduce the cost of organics collection or processing, and 2) directive: those that guide feedstocks towards composting. Of the latter, direct bans on landfilling some or all yard trimmings have been most effective, followed

by stating recycling goals that can only be realistically met by composting yard trimmings. More recently, innovative market-based incentives, such as “carbon credits”, have been proposed to stimulate the recycling of organic residuals without the need for additional mandates.

While some form of composting has been practiced since ancient times, as a modern industry it is barely 30 years old. As the market for compost products matures and differentiates, the demand for compost will grow. At that point the regulatory support may become unnecessary. For now though, we need to keep the bans and other policies in place and not allow yard trimmings to end up in landfills, bioreactor or otherwise. The path to a sustainable society may be long and difficult, but composting organics is clearly a step in the right direction.

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